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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/937,715	01/16/2002	Philip S Russell	124-892	7024

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Nixon & Vanderhye
8th Floor
1100 North Glebe Road
Arlington, VA 22201-4714

EXAMINER

SONG, SARAH U

ART UNIT PAPER NUMBER

2874

DATE MAILED: 09/08/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/937,715

Applicant(s)

RUSSELL ET AL.

Examiner

Sarah Song

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 June 2004.
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20, 22-27 and 30 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☒ Claim(s) 20 and 22-27 is/are allowed.
6) ☒ Claim(s) 1-19 and 30 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on 16 January 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 0104.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Applicant's communication filed on June 21, 2004 has been carefully considered and placed of record in the file. Claims 1, 6 and 10 have been amended. Claims 21, 28 and 29 were previously canceled. Claims 1-20, 22-27 and 30 are pending.

Information Disclosure Statement

2. The prior art documents submitted by the applicant in the Information Disclosure Statement filed on January 7, 2004 have all been considered and made of record (note the attached copy of form PTO-1449).

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. **Claims 1, 2, 5 and 7 are rejected under 35 U.S.C. 102(e) as being anticipated by Borrelli et al. (U.S. Patent 6,496,632 previously cited).** Borrelli et al. discloses a photonic crystal fiber comprising: a region 58 of substantially uniform, lower refractive index; said lower refractive index region 58 substantially surrounded by cladding which includes regions 62 of higher refractive index and which is substantially periodic (the channels 60 providing the periodicity), wherein Figure 7 clearly shows that the region of lower refractive index has a longest transverse dimension which is longer than a single shortest period of the cladding.

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Furthermore, it has been held that the functional “whereby” statement does not define any structure and accordingly cannot serve to distinguish. *In re Mason*, 114 USPQ 127, 44 CDPA 937 (1957)

5. Regarding claims 2 and 7, it is noted that region 58 comprises a gas, such as air (i.e. it is hollow, see column 8, line 65).

6. Regarding claim 5, the regions of higher refractive index consist essentially of silica (glass 62). From Figure 7, it is evident that the fraction of air (represented by circles 60) in the cladding is at least 15% by volume based on the volume of the cladding.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. **Claims 3, 4, 6, 8-19 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Borrelli et al.**

9. Regarding claims 3 and 4, Borrelli et al. discloses the claimed invention, including air holes in a solid cladding matrix, but does not specifically disclose a triangular lattice structure.

10. Triangular lattice structures are well known in the art.

11. Therefore, one of ordinary skill in the art would have found it obvious at the time of the invention to provide a triangular lattice structure instead of the rectangular lattice structure of Borrelli et al. since the criticality of the device does not lie in the particular type of periodic lattice structure, but merely on the presence of a periodic lattice structure.

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12. Furthermore, one of ordinary skill in the art would have been motivated to provide a triangular lattice structure to equalize the spacing in all directions between the periodic channels (represented by circles 60), thereby simplifying manufacture of the fiber.

13. Regarding claim 6, from Figure 7, it is evident that the fraction of air (represented by circles 60) in the cladding is at least 15% by volume based on the volume of the cladding.

14. Regarding claim 8, Borelli et al. discloses the claimed invention except for the region of lower refractive index being a low-pressure region.

15. Low-pressure regions such as vacuums are known in the art to have a similar refractive index as air ($n_{\text{vacuum}}=n_{\text{air}}=1$) and therefore, similar light guiding properties.

16. Therefore, because these two were art-recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found it obvious to substitute the air in the core region of Borrelli et al. with a low-pressure region, such as a vacuum.

17. Furthermore, it is noted that core comprising ambient air (ambient pressure of about 1 atm) is also considered to be a low-pressure region.

18. Regarding claim 9, Borelli et al. does not expressly disclose a lower refractive index region having a non-linear response.

19. Optical fiber core regions comprising materials having non-linear optical responses are well known in the art.

20. Therefore, one of ordinary skill in the art would have found it obvious to provide the low-index region of Borrelli et al. comprising a material having a non-linear optical response.

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21. One of ordinary skill in the art would have been motivated to provide the material having a non-linear optical response in order to amplify an optical signal, improving signal to noise ratios.
22. Regarding claims 10, Borrelli et al. does not expressly disclose a lower refractive index region large enough to support at least one transverse mode.
23. Borelli et al. shows a similar fiber in Figure 6 that comprises a core that is large enough to propagate at least one transverse mode (i.e. a single mode fiber).
24. Therefore, it would also have been obvious to one having ordinary skill in the art at the time the invention was made to provide the region of lower refractive index in the fiber of Figure 7 such that it is large enough to support at least one transverse mode or a single mode.
25. One of ordinary skill in the art would have been motivated to provide the region of lower refractive index that is large enough to support at least one transverse mode in order to provide efficient transmission of an optical signal therethrough without significant losses.
26. Regarding claims 12-19, Borelli et al. does not expressly disclose an optical device, a spectral filtering device, an optical amplifier, a laser, a sensor, a telecommunications system, a telecommunications network, or a method of transmitting light along the fiber by providing a light source.
27. Spectral filter devices, amplifiers, lasers, sensors, telecommunications systems are all well known in the art.
28. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the fiber of Borelli et al. in any well known device that would benefit from the intrinsic low loss of the fiber. It would have been obvious to provide the

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photonic crystal fiber disclosed by Borrelli et al. in any of the above devices in order to resultantly reduce the intrinsic losses of each of the devices.

29. Specifically regarding claim 16, the fiber of Borrelli et al is inherently “capable” of sensing a property of a gas in the core region due to the hollow core structure.

30. Regarding claim 30, it is common practice in the art to provide a light source adjacent an end of any fiber for transmitting light along the fiber. Therefore, since light is coupled into a photonic crystal fiber in the same manner as any other optical fiber, it would have been obvious to one having ordinary skill in the art to provide a light source adjacent an end of the fiber of Borrelli et al. and to arrange for light from the source to enter the fiber for transmission therethrough.

Allowable Subject Matter

31. Claims 20 and 22-27 are allowed for the reasons stated in the Office Action dated June 13, 2003.

Response to Arguments

32. Applicant's arguments filed June 21, 2004 have been fully considered. The arguments with respect to Fink are persuasive and the rejections based upon Fink have been withdrawn. The arguments with respect to Borelli et al. are not persuasive for the following reasons.

33. Applicant states that there is no disclosure in Borelli et al. of, “light being confined to the lower refractive index region...by virtue of a photonic band gap of the cladding material.” Borelli et al. discloses the claimed fiber as noted in the rejection above. Furthermore, the recitation, “whereby light is substantially confined in the lower refractive index region by virtue of a

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photonic band gap of the cladding material” does not serve to structurally distinguish from the prior art. Therefore, the rejection is maintained.

34. Applicant additionally states that the Examiner has failed to set out a prima facie case of obviousness with regards to claims 3, 4, 8-19 and 30. Examiner respectfully disagrees.

However, Applicant is redirected to DiGiovanni et al. (U.S. Patent 5,802,236 previously of record), which discloses a photonic crystal fiber having a triangular lattice structure (Figures 1 and 5), a photonic crystal fiber comprising a material having a non-linear optical response (column 9, lines 35-49), a photonic crystal fiber having core regions large enough to support at least one transverse mode, such as a single mode fiber (column 3, lines 26-27), an optical device including a photonic crystal fiber, and comprising an optical amplifier, a laser (column 9, lines 15-34), a telecommunication system or network comprising a photonic crystal fiber and a method providing a light source and arranging light to enter the fiber for transmission (Figure 3), and a gas sensor (column 1, lines 42-52). Inuzuka et al. (U.S. Patent 5,629,534) is hereby cited for support of the knowledge that the refractive index of air and a vacuum are equivalent. Greenaway et al. (U.S. Patent 6,301,420) is hereby cited as for support of the knowledge of a photonic crystal fiber comprising a spectral filtering device (Figure 6).

Conclusion

35. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO**

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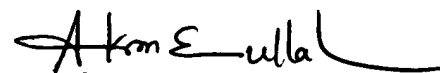
MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sarah Song whose telephone number is 571-272-2359. The examiner can normally be reached on M-Th 7:30am - 6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney Bovernick can be reached on 571-272-2344. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


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PRIMARY EXAMINER